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THE MAGAZINE OF PLANT MANAGEMENT AND OPERATION

*November, 1946*





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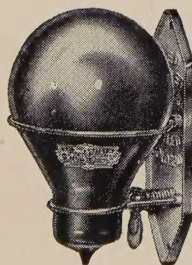
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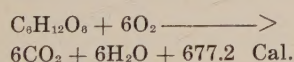
# RESPIRATION AND STORAGE BEHAVIOR *of Soybeans with other Grains*

By PAUL E. RAMSTAD and W. F. GEDDES

Division of Agricultural Biochemistry

University of Minnesota Agr. Exp. Sta.

**R**ESPIRATION is a phenomenon common to all living organisms, but the rate of respiration varies widely as it is affected by both inherent and environmental factors. Aerobic respiration is analagous to oxidative combustion since the initial and final products are the same in both cases. Where hexose sugars are the food materials being utilized, the process may be summed up by the equation:



Usually, stored grain is living material, and hence respiration is an inherent characteristic of the grain itself; in addition, the respiration of bacteria, molds, and insects associated with the grain may account for a large share of the respiratory activity exhibited in storage. When respiration occurs at a sufficiently rapid rate to produce heat more quickly than it can be dissipated, the temperature of the grain rises and heat damage may result.

Spoilage of stored grain may also occur as a result of high respiratory rates even though no temperature rise occurs. Under such conditions, much of the damage is due to decomposition caused by the activity of microorganisms. Consequently, a study of the respiratory rates of grain and the factors affecting these rates

provides a fundamental approach to the problems involved in grain storage.

## Microorganisms Play Role in Respiration Phenomena

**M**OISTURE content has long been recognized as one of the major factors determining the intensity of respiration of stored grain. Wheat, corn, oats, barley, rye, flaxseed, and sorghum grains differ not only in their relative rates of respiration at equivalent moisture contents but also in the form of their moisture-respiration curves. Rye, for example, exhibited a low, and flaxseed a high, inherent rate of respiration. The

This illuminating treatise explains the behavior of stored products with clarity and definiteness, answering several major questions that confront those charged with the safekeeping of grains, beans, and their by-products, etc. While this study is necessarily technical, time spent in thoroughly digesting its full significance will truly be an investment in further understanding of what is going on "behind the scenes," as it were.

greater respiration of flaxseed was attributed to its high oil content which, being unmixable with water, results in a higher moisture content of the hydrophilic [water loving] constituents than in cereal grains at equivalent moistures.

The accelerating effect of moisture on respiration varied with the differ-

ent grains; thus, with sound wheat, a sharp break occurred in the curve at 14.5% moisture; whereas with shelled corn and sorghum grains, there was a fairly uniform increase in respiratory rate with increasing moisture content. In such investigations, the various moisture levels are usually obtained by artificially dampening the grain; the observation of Bailey and Gurjar<sup>6</sup> that the intensity of respiration of wheat increased with time after conditioning when the moisture content exceeded 12% is of particular significance in relation to later researches which revealed the important role played by microorganisms in respiration phenomena at high moisture levels.

## Carbon Dioxide Depresses Respiration

**F**ACTORS other than moisture have a significant influence on grain respiration. Bailey and Gurjar<sup>6</sup> and Bailey<sup>7</sup> have demonstrated that cracked, shriveled, immature kernels respire more rapidly than sound, plump grain of the same moisture

content; the presence of foreign material and of sprouted, frosted, or heat-damaged kernels also was shown to increase respiration. In addition, Bailey and Gurjar<sup>6</sup> investigated the influence of temperature and the composition of the atmosphere on the respiration of wheat. Other factors being equal, increases in temperature up to 131° F. caused an increase in



respiratory rate. An accumulation of carbon dioxide in the interseed atmosphere depressed respiration; wheat respired in an oxygen-free atmosphere but at a greatly reduced rate.

Microorganisms are always found in abundance in heating grain, but the part they play in the heating and spoilage of stored grain has been very difficult to evaluate. Some investigators have ignored the microorganisms entirely, holding that they take no part in the heating phenomena. Others have believed that microorganisms, and molds in particular, are mainly responsible. The most widely accepted conception today is that both the res-

piration of the grain and that of the microorganisms are involved, but differences of opinion exist as to the relative importance of these two factors.

Swanson<sup>43</sup> found that, while mold growth is an indication of damage in stored wheat, inhibition of mold growth by exclusion of air or the use of poisons did not prevent injury to wheat quality. An increase in fat acidity was associated with mold growth, but when air was excluded, injury could take place without development of acidity. The moisture content at which molds developed was closely related to the temperature—the lower the temperature, the higher

the moisture required for mold growth.

### Heat Affects Grains' Viability

**T**HAT saprophytic microorganisms growing on dead organic material under the proper conditions of temperature and moisture can respire rapidly enough to cause heating has been demonstrated by Miehle<sup>35</sup>, Pierce<sup>37</sup>, Darsie, Elliot, and Pierce<sup>39</sup>, James<sup>28</sup>, and James, Rettger, and Thom<sup>29</sup>. However, viable grain is less easily attacked by such microorganisms than dead organic matter. While this suggests that studies with non-living material are not applicable to the case of heating grain, on the other hand, Bakke and Noecker<sup>10</sup>, and Robertson, Lute, and Gardner<sup>39</sup> have shown that grain stored under conditions which predispose it to heating loses its viability [ability to live] very rapidly.

Attempts to study the respiration of grain that is free from microorganisms under conditions which would normally favor their growth have been rather unsuccessful. The use of antiseptic agents or treatments strong enough to inhibit or kill bacteria and mold spores is open to the criticism that the respiration of the grain itself may have been affected. Larmour, Clayton, and Wrenshall<sup>32</sup> treated wheat with carbon tetrachloride and found no mold growth or heating even when the grain contained 25% moisture. On the basis of both respiration and heating experiments, these authors concluded that fungi play an important part in the heating of stored wheat, although they pointed out that the treatment with carbon tetrachloride tended to inhibit embryo activity in the wheat, especially at the higher moistures.

### Variables Determine Grains' Behavior

**S**EVERAL investigators have made direct observations of grain in transit or commercial storage—Duvel<sup>20</sup>, Shanahan, Leighty, and Boerner<sup>40</sup>, Duvel and Duval<sup>21, 22</sup>. Bailey<sup>5, 6, 8</sup> has pointed out that the prediction of the behavior of stored grain is not a simple matter since its keeping qualities depend upon a number of variables including the mass of the grain, the location, shape, and construction of the storage bin, the initial grain temperature, the inherent characteristics and condition of the grain, and the biological factors involved in respiration.

The soybean (Soja max) is a legume and differs markedly in composition from the grains which have been the subject of respiration and storage investigations to date. Horvath<sup>20</sup> gives the average composition of Manchurian beans as 8.5% moisture, 18% oil, 40% crude protein, 28% nitrogen-free extract, and 5.5% ash. He points out that the composition of American soybeans is similar except that they may contain nearly

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twice as much moisture, indicating that their storage would involve difficulties not encountered with Manchurian beans.

## Hygroscopicity of Soybeans and Soybean Oil Meals

THE hygroscopicity [variations in moisture] of soybeans is of importance in relation to storage behavior since moisture content not only affects respiratory rate directly, but is also a critical factor with regard to the growth of bacteria and molds. Weather conditions during ripening

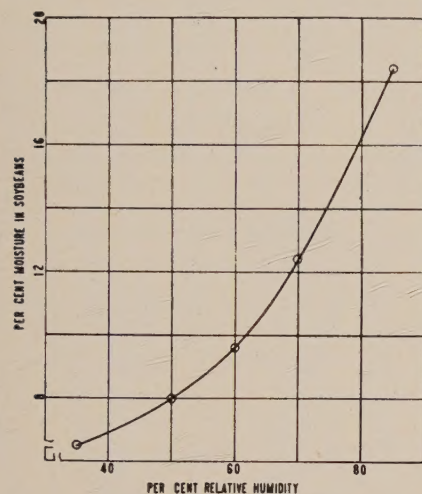


Fig. 1. Hygroscopic Moisture of Soybeans in Equilibrium with Atmospheres of Various Relative Humidities at 77° F.

Table 2. Hygroscopic Equilibria of Soybeans at 77° F.

Relative humidity	Moisture Content at Equilibrium*				
	Dunfield	Illini	Scioto	Illini	Mean
%	%	%	%	%	%
35	6.6	6.3	6.7	6.4	6.5
50	8.0	7.9	8.2	8.1	8.0
60	9.5	9.5	9.8	9.5	9.6
70	12.5	12.1	12.8	12.0	12.4
85	...	18.3	18.4	18.5	18.4

\*Vacuum-oven method.

and harvesting govern the moisture content of soybeans when put into storage and may be responsible for changes in moisture content during storage. Burlison, Van Doren, and Hackleman<sup>14</sup> weighed a crib of stored soybeans at weekly intervals for a period of one year and found that during seasons when relative humidity was highest and temperatures lowest, the beans gained weight, and during the hot, dry summer months they lost weight.

The hygroscopicities of three types of soybean oil meals, namely, an expeller meal, a solvent-extracted meal, and a toasted solvent-extracted meal, were determined with the apparatus described by Anker, Geddes, and Bailey<sup>3</sup>. The results, recorded in table 3, indicate that the hygroscopicity [variations in moisture] curves for soybean oil meals are very similar to that for soybeans, although the meals are somewhat more hygroscopic. This would be anticipated because of their lower oil content and, consequently,

higher proportion of hydrophilic constituents. Toasting apparently reduced the hydrophilic nature of the solvent meal with the result that it possessed approximately the same hygroscopicity as the expeller meal.

Table 3. Hygroscopic Equilibria of Soybean Oil Meals at 77° F.

Relative humidity	Moisture Content at Equilibrium*		
	Expeller meal	Solvent meal	Toasted-solvent meal
%	%	%	%
10	4.9	5.4	4.8
22	6.3	6.8	6.3
30	7.0	7.5	7.0
40	7.8	8.2	7.8
50	8.9	9.2	8.8
58	10.4	10.8	10.4
69	12.8	13.3	12.8
77	16.9	17.1	16.6
90	24.0†	25.6†	26.5†

\*Vacuum-oven method.

†These results are approximate only since no definite equilibrium was attained prior to mold growth.

A comparison of these hygroscopicity values with those obtained by An-

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ker, Geddes, and Bailey<sup>3</sup> for wheat flour shows that up to a relative humidity of 70% soybean oil meals are less hygroscopic than wheat flour; above 70% relative humidity they become very much more hygroscopic than wheat flour. The explanation, as already mentioned, probably lies in the high ash content of soybeans. These data indicate that soybean oil meals may show even greater weight changes with variation in atmospheric conditions and may be more prone to spoilage when stored under conditions of high humidity than wheat flour.

In view of the well known inhibitory effect of carbon dioxide on respira-

Table 4. Effect of Free Air Space on Rate of Respiration\*.

Moisture content	Air space per gram of soybeans	Final CO <sub>2</sub> concentration	Respiration at 100° F. CO <sub>2</sub> /100 g. dry matter per 24 hours
%	ml.	%	mg.
15.1	2.2	2.2	2.3
15.1	3.0	1.6	2.6
15.1	4.4	1.3	2.9
18.6	4.6	7.8	19.4
18.6	7.2	5.8	22.1
18.6	9.4	5.7	28.5

\*Each respiration trial was carried out for four days.

tion, an experiment was conducted to determine the effect of different amounts of free air space in the respirometers on the carbon dioxide pro-

duction of soybeans at two different moisture levels. The results presented in table 4 show that even relatively low concentrations of carbon dioxide cause a reduction in respiratory rate.

### Effect of Moisture Content on Respirations

THE effect of moisture content of soybeans on their rate of respiration is the smooth curve shown in fig. 3 resulting from the means of

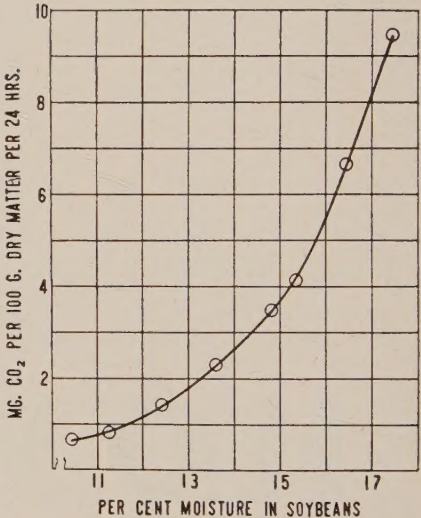


Fig. 3. Relation Between Rate of Respiration and Moisture Content of Soybeans Soon After Conditioning. (Respiration Data Are Based on Four Days Incubation at 100° F.)

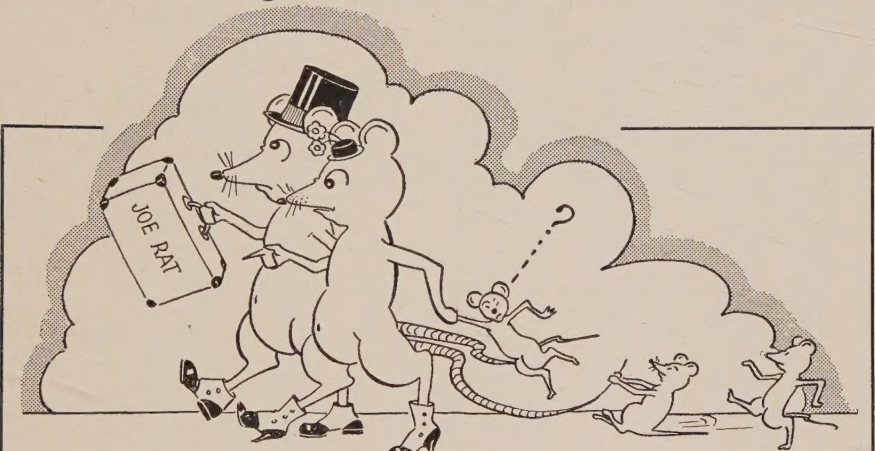
these determinations. Table 6 was prepared by interpolating the respiratory rates at whole percentages of moisture.

Table 6. Effect of Moisture Content on Respiratory Rate.

Moisture content	Respiratory rate at 100° F. CO <sub>2</sub> /100 g. dry matter per 24 hours
%	mg.
10	0.6
11	0.8
12	1.1
13	1.7
14	2.5
15	3.7
16	5.4
17	8.0

It will be noted that there is no sharp break in this curve at any particular moisture value, such as found by Bailey and Gurgar<sup>9</sup> in the case of wheat respiration.

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## Effect of Period of Dampness on Respiratory Activity

WHEN several successive four-day respiration trials were carried out with the same samples, the respiratory rates at moisture contents below about 14% remained virtually constant while those at the higher moisture levels showed a somewhat irregular but, nevertheless, marked increase for each successive four-day period. This resulted in a progressively sharper inflection in the curve near the 14% moisture level, those for the third and fourth periods being similar to typical respiration curves found by Bailey and Gurjar<sup>9</sup> for wheat and by Ramstad and Geddes<sup>38</sup> for oats. All samples showing increased respiration were sour or moldy upon removal from the respirometer. The results given in table 7 show increases in respiratory rate of from 380% to 740%, depending on moisture content. All the samples showed evidence of mold growth.

Table 7. Effect of Time of Storage at 100° F. on Apparent Respiration of Soybeans.

Moisture %	Respiration at 100° F. CO <sub>2</sub> /100 g. dry matter/24 hours	
	Stored 5 days	Stored 30 days
14.5	3.0	11.4
14.7	3.3	16.0
15.7	4.9	32.8
16.2	5.9	43.7

The effect of temperature of storage on mold growth and the attendant increase in respiratory rate was demonstrated by conditioning samples to four different moisture contents and storing for 3½ months at three different temperatures, 36° F., 77° F., 100° F. At the end of the storage period, respiratory rates of the various samples were determined at 100° F. These data are shown in table 8. The respiratory rates of the samples stored at 36° F. are practically the same as those found soon after wetting. These soybeans were free from visible mold, had good color, and a sweet odor. The samples stored at room temperature all showed some mold growth, though not more than a trace was present in the sample containing 13.8% moisture. The samples at 15.8% and 16.9% moisture were quite musty. All the samples stored at 100° F. were moldy, had a sour odor, and a brown color (which was very dark in the case of the 16.9% moisture sample.) Table 8 also includes germination data and the scale readings of these samples on the Burton-Pitt moisture tester.

It is seen from table 8 that at equivalent moisture contents the samples exhibiting the greater respiratory activity gave somewhat higher Burton-Pitt readings, although this latter dif-



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usual obstacles this year. They have not yet been able to overcome the effects of wartime service upon their car supply—especially the boxcars required for most farm products. But they have ordered more cars, which are being built as fast as shortages of materials and production difficulties permit.

Every available boxcar is being worked to the limit. And the same skill, ingenuity, and good old-fashioned sweat with which the railroads handled the immense wartime loads are being used to move this harvest.





Table 8. Effect of Storing Soybeans for Three and One-Half Months at Different Moisture Contents and Temperatures on Respiration, Burton-Pitt Readings, and Germination Capacity.

Lot	Moist.	Temp. of storage	Respiration*	Burton-Pitt†	Germination
	%				%
IA	13.8	100°F.	10.6	101	0
IIA	14.9	100°F.	12.5	117	0
IIIA	15.8	100°F.	24.9	125	0
IVA	16.9	100°F.	72.8	142	0
IB	13.8	77°F.	12.8	102	0
IIB	14.9	77°F.	20.5	111	0
IIIB	15.8	77°F.	25.5	122	0
IVB	16.9	77°F.	44.2	133	0
IC	13.8	36°F.	2.8	101	70
IIC	14.9	36°F.	3.6	107	61
IIIC	15.8	36°F.	4.8	119	75
IVC	16.9	36°F.	7.8	126	75

\*Respiration is expressed as mg. CO<sub>2</sub> produced per 100 g. dry matter per 24 hours at a temperature of 100°F.  
†Burton-Pitt values are expressed on an arbitrary scale and hence are relative values applicable only to these data.

ference was by no means proportional to the difference in respiratory activity.  
Another experiment was carried out which gave a more complete picture

of the effect of time of storage on the respiration of soybeans of various moisture contents stored at room temperature. Respiratory rates were determined with soybeans of various

moisture contents which had been stored in airtight glass jars in the laboratory for 11 months. The results are shown in table 9 together with rates for freshly conditioned beans as interpolated from fig. 3 Here, even the samples of low moisture content showed an increased respiratory rate.

Table 9. Effect of Eleven Months' Storage at Room Temperature on the Respiration of Soybeans.

Moisture content	Respiration at 100°F. CO <sub>2</sub> /100 g. dry matter/24 hours	
	After 11 months' storage at room temp.	4 days after conditioning
%	mg.	mg.
9.0	0.9	..
10.7	1.3	0.7
11.3	1.4	0.9
11.7	2.4	1.0
12.2	4.6	1.3
15.0	17.4	3.7
15.8	31.6	5.0
17.1	66.5	8.2
19.8	172.0	..
20.9	280.0	..

It is of interest to ascertain whether storage of soybeans at high moisture contents would alter their respiratory activity when dried to lower moisture levels. A lot of soybeans was conditioned to 16.4% moisture and stored at room temperature for three months, then allowed to air-dry to various moisture contents, stored in airtight containers for four days in order that the moisture distribution might come to equilibrium, and the respiratory rates determined. The results are given in table 10, together with the rates for freshly conditioned beans of the same moisture content, as interpolated from fig. 3. It is seen that the respiratory rates of the air-dried soybeans were somewhat higher than those for freshly conditioned beans even at the lowest moisture content and diverged rapidly above 12.9% moisture.

Table 10. Respiratory Rates of Soybeans Stored for Three Months at Room Temperature at 16.4% Moisture and Air-Dried to Various Moistures Compared with the Respiratory Rates of Soybeans at These Same Moisture Levels Shortly After Wetting.

Moisture	Respiration at 100°F. CO <sub>2</sub> /100 g. dry matter/24 hours	
	Dried samples	Original
%	mg.	mg.
10.9	1.6	0.8
12.9	2.3	1.6
14.1	8.7	2.7
14.4	11.0	3.0
14.9	14.0	3.6
15.1	19.7	3.9
16.4	39.4	6.4



# How to Avoid Saving Money

by DANNY KAYE

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## Comparison of Respiratory Activity of Naturally Damp and Artificially Dampened Soybeans

THE respiratory activity of samples which had not been allowed to dry in the field did not differ appreciably from that of beans which were artificially conditioned to the same moisture levels.

The respiratory rates of high moisture samples obtained from commercial channels, of which nothing was known of their previous history, do not show a consistent relation to moisture content. It has already been shown that respiratory activity of soybeans is dependent not only on moisture content, but also on the temperature and length of the storage period. It would seem reasonable to attribute the apparently anomalous respiratory behavior of these samples to differences in their history, more particularly with the opportunity provided for the development of microorganisms.

Table 12. Respiratory Rates of Naturally Damp Soybeans.

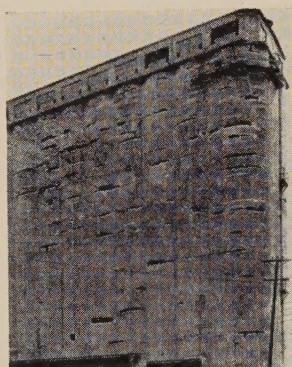
Moisture content	Respiration at 100° F. CO <sub>2</sub> /100 g. dry matter/24 hours
%	mg.
14.8	5.5
16.2	11.6
17.7	14.1
18.0	10.6
18.2	20.8
18.3	13.4
18.3	20.0
18.7	16.5
18.8	49.8
19.5	42.9
20.0	35.3

## Influence of Temperature on Soybean Respiration

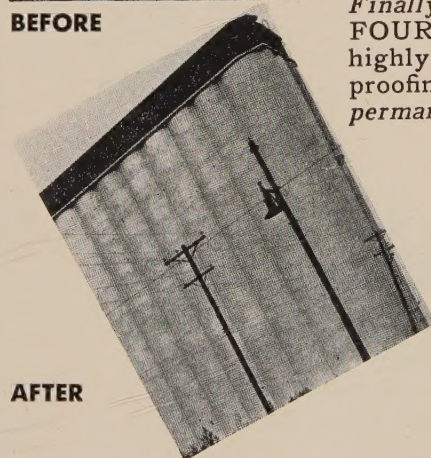
TEMPERATURE exerts a very marked effect on the respiratory activity of stored grain. Bailey and Gurjar<sup>9</sup> showed that the respiratory rate of wheat increased with temperature up to 131° F.; above 131° F., inactivation of enzymes proceeded very rapidly and caused a decrease in carbon dioxide production. The acceleration of respiration was not uniform but varied with the temperature. The most rapid change took place between 95° and 131° F. Coleman, Rothgeb, and Fellows<sup>17</sup> found that sorghum grains over a series of moisture levels respired about twice as rapidly at 100° F. as at 82° F. That the accelerating effect of temperature on the respiration of soybeans is not uniform may be explained, at least in part, by variations in the number and kind of microorganisms present at different temperatures.

## Respiration of Split Soybeans

BAILEY<sup>7</sup> showed that cracked corn had an appreciably higher respiratory rate than whole sound corn within the range of moisture contents



BEFORE



AFTER

## FOR MORE PROTECTION

Elevators take a terrific "spanking" from the elements. Heat, cold . . . contraction, expansion. Cracks develop, water seeps in, steel corrodes, deterioration sets in.

All damage is repaired with reinforced Gunite. Thin surfaces are completely cleaned with sand and then waterblasting. Finally, not one, or two, or three, but **FOUR** coats of chemically compounded, highly elastic In-Fil-Tro-Flex weatherproofing are applied . . . all cracks are permanently sealed . . . surfaces remain water tight, weatherproof.

A B. J. Many job costs more, it's worth more: it lasts longer . . . and that's what counts. Cheap materials and faulty workmanship represent false economy. Profit by this enduring, *four-fold* protection. B. J. Many engineers will inspect your structures and submit cost estimate upon request.

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500 Rona Street, Asbury Park, N. J.

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3723 Grand Central Terminal, New York 17, N. Y.

AUTHORIZED AGENTS: Pioneer Sand & Gravel Co., Inc., 901 Fairview Ave., North, Seattle 11, Wash.; Asphalt Services, Ltd., 366 Adelaide St., West, Toronto 10, Ont., Canada; Northland Machinery Supply Co., Ltd., 203 Hardisty St., Fort William, Ontario; Northland Machinery Co., Ltd., Winnipeg, Manitoba.



**Table 13. Effect of Temperature on the Respiratory Rate of Soybeans**

Moisture content	Temperature	Respiration CO <sub>2</sub> /100 g. dry matter/24 hours
%	°C.	mg.
17.3	37.8	6.6
17.3	25	5.6
17.3	4	0.6
13.5	50	7.1
13.5	37.8	3.7
13.5	25	0.6
13.5	15	0.4
13.5	4	0.1

studied (13.5 to 17%). He expressed doubt that this increased rate of respiration was due to the mechanical injury in itself since corn in this mois-

ture range has a much lower respiratory rate than those tissues in which a mechanical injury effect has been shown. Rather, he attributed the increase to improved conditions for gaseous diffusion to and from the respiring cells and to improved opportunity for growth of fungi on the surfaces of the broken fragments.

Very striking results were obtained in a study of the comparative respiratory rates of whole and split soybeans. A quantity of split soybeans and whole soybeans from the same lot, varying from 13.9% to 15.8% moisture, after storing for four weeks at room temperature (approximately 77° F.) showed respiratory rates de-

termined at 100° F. as in table 14. Within the range of moisture content covered by these experiments, the respiratory activities of the whole and split beans diverged rapidly. At 15.8% moisture, the splits respired more than six times as rapidly as the whole beans of the same moisture stored under the same conditions and about twenty-four times as fast as whole soybeans of that moisture content four days after conditioning.

**Table 14. Respiration of Split and Whole Soybeans Four Weeks After Conditioning.**

Moisture content	Respiration at 100° F. CO <sub>2</sub> /100 g. dry matter/24 hours	
	Whole Beans	Split Beans
%	mg.	mg.
13.9	3.0	6.3
14.3	7.2	15.2
15.1	...	73.0
15.7	...	98.2
15.8	...	120.4
15.9	17.9	...
16.3	31.1	...

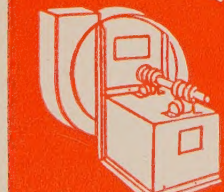
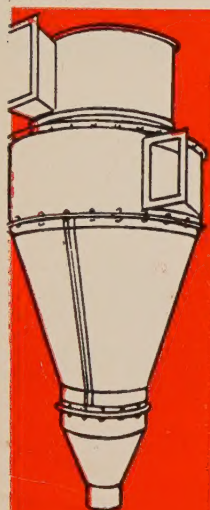
### Effect of Storage Conditions on the Viability of Soybeans

CONSIDERABLE difficulty has been experienced in maintaining the viability of soybeans in storage. Investigations of Simpson<sup>41, 42</sup> with cottonseed and of Robertson, Lute, and Gardner<sup>39</sup> with wheat, oats, and barley showed that the germination capacity of such grains decreased with increasing moisture content and with the time and temperature of storage. Burlison, Van Doren, and Hackleman<sup>14</sup> investigated the effect of time and conditions of storage on the germination of soybeans. They found that the viability of soybeans stored depends not only upon the age of the seed, but upon the condition of the unit, the moisture content of the beans when stored, and the depth of the beans within the unit.

In order to study the effect of moisture content on loss of viability, soybeans were conditioned to 10 moisture levels varying from 9.4 to 19.1%. For the early storage periods, the results of the successive germination trials were somewhat variable, and only data obtained at the end of three months' storage are recorded in table 16. It will be noted that the viability decreased markedly with increasing moisture content. After 20 months' storage all the samples were completely nonviable except the lowest

**Table 16. Germination of Soybeans After Three Months' Storage at Room Temperature (Original Germination 85%).**

Moist. cont.	Germination	Moist. cont.	Germination
%	%	%	%
9.4	78	14.6	4
10.5	67	15.5	1
11.8	37	16.6	0
12.6	41	18.0	0
13.7	9	19.1	0



## SPOUTING that FITS!

DAY precision machinery—such as 10 foot shears, rolls, gang punches and other equipment—combined with DAY'S 65 years' experience, accurate layout and skilled workmanship assure dependable and economical fabrication of spouting, elevator leg casings, boots and heads.

DAY DUST CONTROL engineers are always at your service. Write us about your problems.

**The DAY Company**  
3 PLANTS for SERVICE and SAVINGS to YOU

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In CANADA—Fr. William, Ont., P. O. Box 70





moisture sample which germinated only 45%.

Storage at low temperature may aid materially in maintaining the viability of soybeans at a high level. This is indicated by the studies summarized in table 8. When soybeans of moisture contents varying from 13.8% to 16.9% were stored for 3½ months at room temperature and at 100° F., none of the soybeans was viable. However, samples at the same moisture contents stored for the same length of time in a cold room at approximately 36° F. retained a high degree of viability. Tests, after 18 months' storage, showed the germination of these cold storage samples at moistures of 13.8, 14.9, 15.8, and 16.9% to be 85, 84, 78, and 42%, respectively. In the case of soybeans stored in sacks or metal cans with loosely fitting lids, a loss of 50% in germination was observed after one year's storage at room temperature.

#### Effect of Damage in Storage on the Chemical Composition of Soybeans

**C**ARBOHYDRATES are the chief materials metabolized by stored soybeans. At high moisture contents most of the nonreducing sugars have apparently been converted to reducing sugars which, in turn, are used in respiration, but at a somewhat less rapid rate than they are produced, which results in an increase in reducing-sugar concentration.

#### Adiabatic Storage Studies; Grain Bin Aeration Essential to Heating

**W**HEN high-moisture grain is stored in bulk, heating may take place which would not occur in a small sample of the same lot of grain. This is because of the so-called "mass effect"; grain is a relatively poor heat conductor and since loss of heat is proportional to the surface, the loss is reduced when the mass is increased. Heating of grain may, however, be studied even when the sample is small if some means is provided to prevent loss of heat.

Using corn meal of high moisture content, little heating was observed unless the sample was aerated. Samples which heated were always moldy at the conclusion of the experiment. Investigations of James, Rettger, and Thom<sup>20</sup> employing this technique demonstrated the importance of microorganisms in the heating phenomenon.

Gilman and Barron<sup>21</sup> noted that bin-burned grain was invariably moldy. Their experimental observations indicated that marked increases in the temperature of stored grain may be ascribed to mold growth. Quite large variations were noted in the thermogenic powers of different molds growing on the same grain and also in the heat production by a particular mold growing on different grains.

Bakke and Noecker<sup>20</sup> studied the relation of moisture to respiration and heating in stored oats. Respiratory rates were determined by measuring oxygen uptake while heating was followed by measuring the temperature increase of oats kept at 77° F. No means was provided for aerating. While, in general, respiratory rate and heating were found to increase with increasing moisture content, a great deal of variation was observed between samples of the same moisture content. The authors attributed these apparent discrepancies to variations in the mold populations of the various samples.

Many workers have shown that aeration is essential to heating and it is therefore surprising that Bakke and Noecker secured any appreciable heating since their grain was stored in stoppered flasks. They apparently assumed that aeration does not take place in bulk storage; evidence will be presented later which indicates that, even in very large elevator bins, grain is probably slowly aerated.

Trials in this laboratory demonstrated that the heating of grains in aerated Dewar flasks kept at constant temperature could be observed only if the moisture content was considerably in excess of moisture levels at which grain is known to heat in commercial storage.

# Douglas



## MAXIMUM STORAGE PROTECTION

Your battle is only half won when your grain reaches the storage bin. It is safe from rain, hail and wind—but what about weevil, high moisture, musty odors and heating conditions?

The operator who holds grain in storage because he wishes to or because he is forced to, recognizes these factors and turns to "TETRAFUME." A practical program for keeping grain in condition has been developed. Apply one quart of "TETRAFUME" to each 1,000 bushels of grain as the grain is placed in storage, and repeat the application during each periodic turning period. You get triple your money's worth—and more—out of every gallon of "TETRAFUME" you buy.

Hundreds of elevators, including many of the country's largest operators, now use this plan.

You can cut your storage losses to a minimum by using "TETRAFUME."

**For MAXIMUM STORAGE PROTECTION, ORDER TODAY.**

"PIONEERS OF SAFE INSECTICIDES"

*Douglas Chemical and Supply Company*

1324-26 West 12th St. INCORPORATED 1916 Kansas City, Missouri

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MINNEAPOLIS, MINNESOTA; PORTLAND, OREGON.



# A Lasting Elastic RAINCOAT

for your  
Mill Buildings  
and  
Storage Tanks

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ASK US

**THE H. J. MELLEN COMPANY**

53 W. Jackson Boulevard  
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Experts in Restoration, Water and  
Weatherproofing of Grain Stor-  
age Tanks and Mill Buildings.

DUM DUM CONTRACTORS

Employing a commercial lot of soybeans, four heating trials were carried out at moisture levels of 14.7, 15.6, 17.5, and 18.8%, respectively. The beans at 14.7% moisture content failed to heat in 64 days even though a period of warm weather shortly after the trial was begun raised the temperature of the beans to 90° F. These beans were sound and free from mold upon removal from the respirometer and were employed for the trial at 15.6% moisture.

The results of the heating trials are shown graphically in fig. 5. The beans stored at 15.6% moisture increased from an initial temperature of 81° F. to a maximum of 126° F. in 53 days; those at 17.5% moisture rose from 79° F. to 88° F. in 23 days when the trial was terminated. The beans stored at 18.8% moisture heated more rapidly and rose from a temperature of 79° F. to 126° F. in 14 days at which time the respirometer was emptied. From these results it would appear that soybeans having a moisture content of over 15%, as determined by the two-stage vacuum-oven method, are liable to heat in storage.

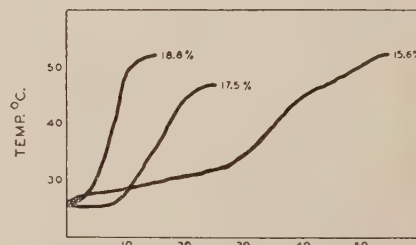


Fig. 5. Effect of Moisture Content on the Rate of Heating of Soybeans in the Large Adiabatic Respirometer

Preliminary experiments were conducted with another two samples of soybeans, one of which had been stored for several months at 19.3% moisture and was very moldy; surprisingly, it failed to heat when placed in the adiabatic respirometer for 8 days. Apparently the flora present were not thermogenic. James, Rettger, and Thom<sup>28</sup> have reported finding organisms which proliferated freely but did not produce heating even though other strains of the same organisms were powerfully thermogenic.

The other preliminary trial was carried out with a 500 g. sample of sound soybeans conditioned to a moisture content of 19.9% and placed in the respirometer immediately. After eight days the beans started to heat and reached a temperature of 112° F. on the eighteenth day when the experiment was ended.

(To be concluded next month)

Chicago cop (producing fine-book):  
"What's your name?"  
Visiting Convention Super: "Aloysius  
Alastair Cyprianimus."  
Cc: "Well, don't let it happen again."



## Retirement of First Employee Recalls Early Cleaning History

Growth of the Hart-Carter Company from a three-man shop to an internationally known manufacturing concern was recently recalled at a retirement dinner for John J. ("Jack") Varuska, the first employee. Varuska joined the company in May, 1919, when it was only an idea in the minds of his machine shop friends Clarence W. Carter and J. H. Mayhew. Carter was the firm's inventive genius, Mayhew its mechanical and business mind, and Varuska was Mayhew's "right hand man." He also became one of the first stockholders.

### Started in 20-Foot Square

Carter and Mayhew started the Carter-Mayhew Mfg. Company in a 20-foot square of rented space in a Central avenue machine shop in Minneapolis. In one month they moved into larger quarters; in five months they produced their first Disc Separator; in two years they were a substantial manufacturing concern doing

of grain cleaning, grading, and processing equipment. It sells directly from Minneapolis to every grain producing and processing country in the world.

From the original 20-foot square of space, the company's facilities have expanded until its Carter-Mayhew division plants at Minneapolis, and the Hart-Emerson Company subsidiary at Winnipeg, now occupy over 160,000 square feet of floor space. Included is a separate building for experimental and engineering work, in which Varuska has spent much of his life with

cleaned 30 bushels of grain with an early model disc separator. When Varuska asked him what he thought of the operation the miller replied solemnly: "I don't believe it." Up to that time, all grain had commonly been "cleaned" by being shaken through sieves which only separated the grain by general size. The disc separator separates the grain by length, giving completely accurate separation.

Varuska, pictured herewith, now 67, plans to spend his time "hunting and fishing."

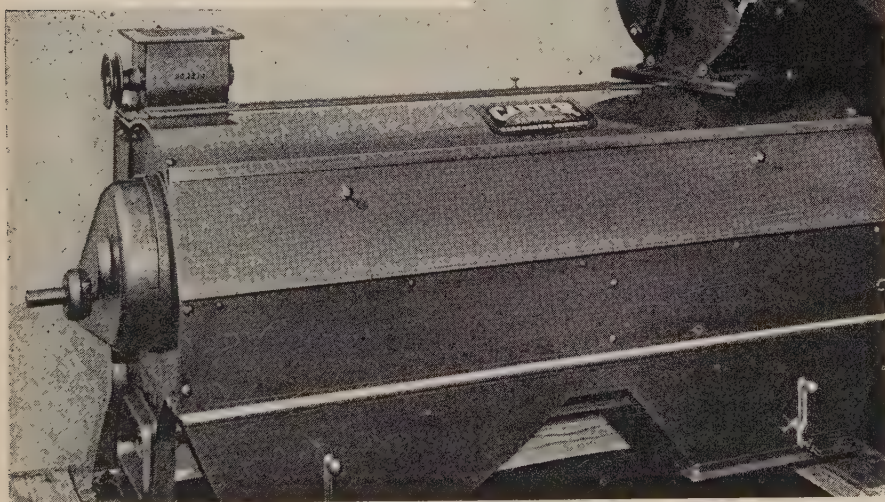
### SLIM CARLSON REPORTS

Frank E. "Slim" Carlson, well known engineer of the Underwriters' Grain Ass'n of Chicago, insurance underwriters on many large grain terminals in the Central West, reports seeing a sign in front of a second-hand book store in Chicago reading:

"Now Available at \$1.49—Ben Ames Williams' 'Strange Women.'"

On the other side of the sign was: "Now Available for \$1.00—'Kitty.'"

Another of his choice bits was an ad appearing in a Peoria newspaper, reading: "Used Secretary — \$15.00. Just the piece you have been waiting for.—Acme Furniture Co."



an international business. Today the Hart-Carter Company (so designated since a 1928 merger with the Hart Grain Weigher Co. of Peoria), manufacturers several types of disc separators included in an extensive line

the staff who have developed such other well-known Hart-Carter products as the Scalperator, Millerator, Disc-Cylinder Separator, Uni-flow Cylinder Separator, and Duo-Aspirator.

### Early Failure Predicted; Seeing But Not Believing

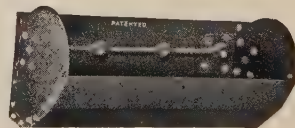
Many of the first grain men and millers to learn of the new "gadget" Carter and Mayhew were promoting were skeptical. When one of them learned that the machine would cost "maybe \$1,000," he predicted an early company failure. Some of the larger disc separators made since have sold in substantial numbers for several times that price.

Varuska tells of a country miller who watched him in silence as he

### GRAIN ELEVATOR FOR SALE

Northwest Chicago, on C. M. St. P. & P. Ry., private switch track, 350,000 bu. capacity, 17 circular tile and concrete bins in good condition. Hess Drier. Vacant adjoining provides room for expansion. Priced right for immediate possession.

**Northwestern Yeast Co.**  
1750 N. Ashland Ave.  
Chicago 22, Ill.



THE FACT STILL REMAINS  
that  
SUPERIOR ELEVATOR CUPS  
are  
MADE STRONGER  
will  
LAST LONGER  
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### GREATER CAPACITY

and will operate more efficiently at less cost than other elevator cups.

"DP" - "OK" - "CC" - "V"

write to

**K. I. WILLIS CORPORATION**  
MOLINE, ILLINOIS

for names of distributors  
and analysis form No. 20



## RODNEY BUYS WESTERN

The Western Terminal Elevator of Hutchinson was purchased by the Rodney Milling Co. of Kansas City. Hal Davis, who was formerly with Bruce Young, is operating the properties for Rodney.

## BUYS TERMINAL

The Canada Malting Co. Ltd., has acquired a terminal elevator in Port Arthur, Ont., from Federal Grain Ltd. A new malting plant is to be constructed beside the large water side storage unit.

## NORTHWESTERN YEAST SELLS

The plant and equipment of the Northwestern Yeast Co., Chicago, was sold at auction. The replacement value of the properties was placed at \$3,000,000. A 350,000 bu elevator adjoining is still for sale.

## FLEISCHMANN SELLS

Roland E. and George H. Reinders, and H. A. Peterson have acquired the fire damaged properties of the Fleischmann Malting Co. at Watertown, Wis. While the brothers operate the firm of Reinders Brothers at Elm Grove, a separate company has been formed to run the local plant. For the present only the elevator will function, however the malt house section may be used for manufacturing feed at a later date.

The heavy fire loss occurred on Mar. 1. Mr. Peterson was then associated with the Fleischmann interests, who operated this property for 22 years.

It's not difficult to meet expenses these days. In fact, you meet them every time you turn around.—Phoenix Flame.

## FENDER BENDERS



## RALSTON BUYS DAVENPORT ELEVATOR

Ralston-Purina Co. has acquired Continental Grain Co.'s 300,000 bu elevator in Davenport in which a new gas-fired grain drier was recently installed. The plant was formerly operated by Bert Dow as the Davenport Elevator Co. The elevator adjoins the Ralston plant. Storage capacity now under Ralston operation here totals 1,100,000 bushels.

## RALSTON BUYS TAYLOR

The Ralston-Purina Company, St. Louis, has purchased the Taylor Milling Corp. of California which will become the first Ralston feed mills on the Pacific Coast. Established in 1907, the Taylor company has done an annual volume of around \$20,000,000 with major manufacturing plants at Oakland, Stockton, Visalia, and Los Angeles. The Oakland plant has 1,000,000 bu storage capacity.

## NEW BEAN CONCERN

Harold A. Miller will head the newly formed Louisville Soy Products Co. of Louisville, Ky. Capitalized at \$4,000,000 by grain and milling interests of Atlanta, Ga., and Huntington, W. Va., the new firm has purchased the soy products division of the Midwest Industries, Inc., at 1361 S. 15th St. The plant will have 100 tons daily capacity when present expansion work is completed.

## CARGILL CONSOLIDATES NUTRENA OPERATIONS

Consolidation of operations of Nutrena feeds and Cargill feeds is announced by John H. MacMillan, Jr., President of Cargill, Inc. Nutrena Mills, Inc., of Kansas City, Kan., will retain its identity as a subsidiary and "Nutrena" will eventually become the brand name throughout the 15 states served. R. E. Whitworth, Nutrena president, moves to Minneapolis to become general manager of the feed division. Additional productivity capacity is planned.

## EXPOSURE FIRE

The Toberman Grain Co. of St. Louis, Mo., suffered damage to its plant and contents on Oct. 5 when a \$1,000,000 fire in a nearby cold storage plant ignited its properties. In addition to fire damage in a bin of brewers dried grain, where the blaze first started, there was considerable loss from water being poured on other bins of grain.

## BUFFALO DUST EXPLOSION

A dust explosion and flash fire, said to have started on the stairway leading from the first floor of Archer-Daniels-Midland Co.'s Buffalo linseed oil mill, resulted in little damage, although firemen were kept busy for over two hours. Two employees received brushburns on the hands when they slid down ropes in escaping the flames.

## 317 MILLS GRIND 93% OF FLOUR

Of the 1,127 mills reporting their flour grind to the U. S. Department of Commerce during September, which totaled 54,210,000 bu wheat, 317 of them ground 93%, or 50,509,000 bu. The previous month 1,124 mills ground 51,442,000 bu and the year previous 1,036 mills ground 51,885,000 bu.

## CARLOADINGS HIGH

Cars loaded with grain and grain products during the last period have averaged over 50,000 a week—which would be near a peak figure a few years back. For the first 45 weeks of the year more cars were loaded than during the entire 12 months of most previous calendars. Were it not for the shortage of rolling stock it is obvious that this year's movement would establish a new high record. Recent shipments were:

	1946	1945	1944
Oct. 12 . . . .	49,735	53,828	49,997
Oct. 19 . . . .	50,237	59,732	56,724
Oct. 26 . . . .	52,409	57,484	55,721
Nov. 2 . . . . .	52,165	59,070	54,606
Nov. 9 . . . . .	49,424	57,340	51,511

## FORD SELLS SOY MILL

Soybrands, Inc., has purchased the Ford Motor Co. soybean processing plant at Saline, Mich. Also, being converted for other uses is the soybean mill at Ford's Big Rouge plant in Dearborn, Mich.





## "The Sullivans of Toronto"

### Doing Outstanding Representation

#### Job for American Manufacturers

The roster of well known American names in the grain, milling and processing equipment field who are making a bid for Canadian business is constantly growing. Three good reasons for the invasion of the bilingual country to our north are the "Sullivans of Toronto"—reading from left to right: Frank J., Jordan and Paul. This trio of go-getters recently formed the concern of Sullivan Mill Equipment Limited, 637 Davenport Road, Toronto, serving the trade as manufacturers and manufacturers' representatives.

Frank, known to the trade far and wide as "Sully," was born on a farm in Eastern Ontario and started in the machinery game in 1900. After spending six years at Galt, Ont., he joined the International Harvester Co., becoming departmental Superintendent in Hamilton and Auburn, N. Y. In 1915, "Sully" entered the flour and grain business. Later he opened the Eastern Branch of Strong-Scott Manufacturing Co. and has managed the Toronto branch continuously ever since—with the exception of a short period when he was assistant manager of the head office in Winnipeg.

Jordan Sullivan got his start with Strong-Scott as office boy in 1933 and worked to the position of assistant manager. Paul Sullivan joined the concern in 1938, enlisted in the Royal Canadian Airforce in 1940, and after five years of service as Flight-Lieutenant he rejoined the organization as sales engineer.

The firm will manufacture and sell, through arrangement with Screw Conveyor Corporation of Hammond, Indiana, the well known "Nu-Hy" Grain Bucket, and the "Nu-Type" Flour and Soft Stock Bucket. These buckets have won a wide acceptance from the Canadian trade, and the

Sullivans feel that the "made in Canada" indicia will give these patented and trade marked buckets an ever increasing popularity. Already the trade's response to the initial announcement of Sullivan Mill Equipment Limited on "Nu-Hy" and "Nu-Type" buckets has been highly gratifying, according to Jordan Sullivan, vice president.

A list of concerns represented by the Sullivans includes:

*S. Howes Co., Inc., Silver Creek, N. Y., Eureka flour feed and grain machinery; Screw Conveyor Corporation, Hammond, Indiana, Screw Conveyor, Screw-Lifts and Screw-Veys; A. T. Ferrell & Co., Saginaw, Mich., complete line of seed cleaning machinery; Tobler, Ernst & Traber, New York, Dufour bolting cloth; California Pellet Mill Co., San Francisco, pellet mills; Innis, Speiden & Co., New York, Larvacide mill fumigant; Union Iron Works, Decatur, Ill., corn shelling equipment; Richmond Mfg. Co., Lockport, N. Y., flour sifters and spout magnets; The "O-K" Scale Co., Buffalo, N. Y., bagging scales; Schutte Pulverizer Co., Buffalo, hammer mills; Buffalo Weaving and Belting Co., cotton belting; Seedburo Equipment Company, Chicago, grain and seed testing equipment.*

In addition to this imposing list, a veritable "Who's Who" in the grain, milling and processing field, Sullivan

Mill Equipment Limited carry complete lines of equipment for seed plants and food processing concerns.

"The outlook is very good," according to Paul Sullivan, who recently completed a flying trip of the Dominion. "Demands for equipment continue to grow as the industry continues to step up handling capacities, as bumper crop after bumper crop follows Canada's 'shoulder-to-the wheel' program to help feed the world."

#### ODE TO THE TYPOGRAPHICAL ERROR

The typographical error is  
A slippery thing and shy;  
You can hunt it till you're dizzy,  
But somehow it gets by.

Till the forms come off the presses,  
It is strange how still it keeps;  
It shrinks down in a corner.  
And it never stirs or peeps.

That typographical error,  
Too small for human eyes,  
Till the ink is on the paper,  
When it grows to mountain size.

The editor stares in horror,  
Then he grabs his hair and groans;  
The copyreader drops his head  
Upon his hand and moans.

The remainder of the issue  
May be clean as clean can be,  
But the typographical error  
Is the only thing you see!

—From the Grainville Bugle.

Van Dusen-Harrington Co.

## HAVE YOU EVER STUDIED *why* THE NU-HY BUCKET *Out-performs* CONVENTIONAL BUCKETS?

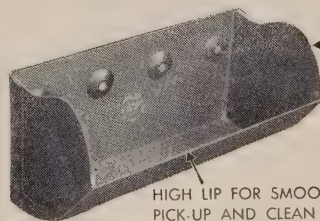
### Here are facts for you to consider



PATENTED

No idle space on belt when "Nu-Hy's" are installed.

"Nu-Hy" Buckets are scientifically built. Their very shape permits closest possible spacing on belt with no lost area. The bottoms of the buckets conform to the top. The lip is also at the right height. In scooping up the grain, there is no banging or steam shovel attack. Grain is picked up with a steady rhythm. They pick up more, hold more, hence deliver more than any other type of bucket. We can show you how to increase the capacity of your legs by filling in our Form No. 76. Write for it and bring your elevator legs up to their highest potential capacity.



HIGH SWEEPING SIDES

HIGH LIP FOR SMOOTH PICK-UP AND CLEAN DISCHARGE

## A QUARTER OF A CENTURY SERVING THE MILLING TRADE

Distributors of Crocker-Wheeler Motors, Square D Control, Worthington Pumps and Air Compressors, International Diesel Engines, Lovejoy Couplings, Weston Meters, Line Material Company's Transformers and line builders' supplies, as well as many other products. Dust Tight equipment in stock for immediate shipment. Motors and Control for rent in emergency.

## PORTER ELECTRIC CO., INC.

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Geneva 8655  
Electrical Equipment Coast to Coast

**Screw Conveyor Corporation**  
707 HOFFMAN ST. HAMMOND, IND.  
ENGINEERS MANUFACTURERS  
TRADE MARK REG. PRODUCTS U.S. PAT. OFFICE



## John Mack Out in Front on New Memberships

John Mack, SOGES Director and First Vice President of the revived Buffalo Chapter, tops the list of those turning in new members to date. This Superintendent of Pillsbury's Mutual Elevator has a comfortable lead over his nearest contenders, according to figures compiled by the SOGES New Membership Committee which show three active members tying for second place, five tying for third place, and sixteen ready to step up into the next highest bracket at the first opportunity.



"Of particular interest," comments SOGES President Harold C. Wilber of A. E. Staley Mfg. Co., Decatur, Ill., "is that so many consistently active members' names appear in this list, along with a gratifying number of new names." Present standings are given, as follows:

John Mack .....	5
Jake C. Kintz .....	3
John Goetzinger .....	3

James Auld .....	3
Herbert C. Brand .....	2
Ralph Garber .....	2
Ward Stanley .....	2
C. Wallace Clark .....	2
Harley J. Hixson .....	2
William A. Thomson, Jr. ....	1
Norman Boardway .....	1
Arthur C. Benson .....	1
Emil Buelens .....	1
William Feemster .....	1
L. R. Ginn .....	1
M. M. "Mac" Darling .....	1
Charles F. Walker .....	1
Wayne P. Anderson .....	1
William Grogan .....	1
Lloyd E. Forsell .....	1
Russell B. Maas .....	1
George Spafford .....	1
Oral B. Duncan .....	1
H. A. Kimberlin .....	1
Smith L. Champlin .....	1

### BUFFALO CHAPTER REVIVED

The Buffalo SOGES Chapter has been revived through the very active interest of a group of members desirous of reaping the benefits of the discussions made possible through this medium. A report received from SOGES Director John Mack states

that the following were elected to office:

President—Cornelius H. "Jersey" Halsted, Super, Frontier Elevator, General Mills, Inc.

1st V. P.—John Mack, Super, Standard Elevator, Standard Milling Co.

2nd V. P.—Roy Zimmerman, Super, Canadian Pool Elevator, Superior Grain Corp.

Secretary—James O. Burns, Super, Mutual Elevator, Pillsbury Mills, Inc.

Treasurer—John Kitching, Super, Co-operative G.L.F. Elevator.

Sergeant-at-Arms—Henry Bowman, G. J. Meyer Malt & Grain.

Monthly meetings are being scheduled, and a representative delegation is expected from this Chapter at the annual SOGES convention in Kansas City next May 15-16-17th, according to Super Mack. Messrs. Mack and Bowman, and Clarence Goetz of the Concrete-Central Elevator operated by Continental Grain Co., were the prime movers responsible for this commendable effort.

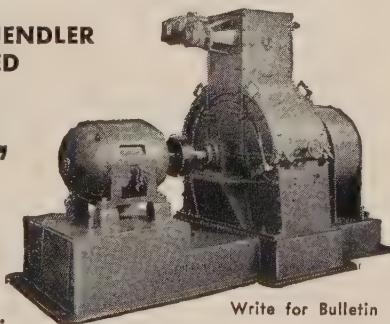
To be happy in one's work, to have the faith of those who love you, to see smiles upon the lips you love—what more can fame and fortune do for a man?—Anon.

## For Cooler and More Uniform FINE GRINDING Together with Large Capacity . . .

Look to the GRUENDLER  
SLOW SPEED

### "PEERLESS ARISTOCRAT" FINE GRINDER

... Has the new type  
Screen Lock for  
fast screen changes.



Write for Bulletin

The new and improved patented features of the "ARISTOCRAT", so outstanding, have won the approval of the Commercial Feed Millers,—over one hundred of the large 150 H.P. "Aristocrat Units" have been installed in Commercial Feed Plants in the past two years.

For large production and fine uniform grinding of all free flowing grain and for the regrounding of dehydrated or sun-cured alfalfa you will find the Aristocrat Grinder your choice.

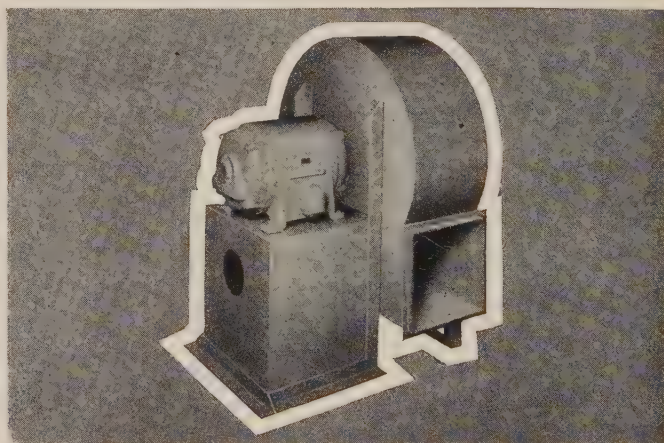
Also Mfrs. of Custom Feed Grinders



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CRUSHER & PULVERIZER CO.

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## Improved designs of all types for every ELEVATOR AND MILL SERVICE

GENERAL

### Steel Plate Blowers and Exhausters—

For air moving material handling.

### Disc and Propeller Fans—

For ventilation and dust disposal.

### Industrial Vacuum Cleaners—

For dust and spillage pick-up.

### Roof Ventilators—

In rotary and stationary styles.

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Engineers and Manufacturers

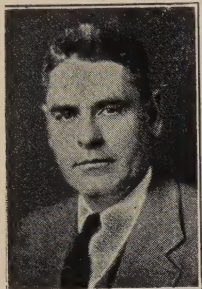
Factory Offices  
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District Sales  
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CHICAGO 10, ILL.



## WHERE TO IN '48 AND '49?

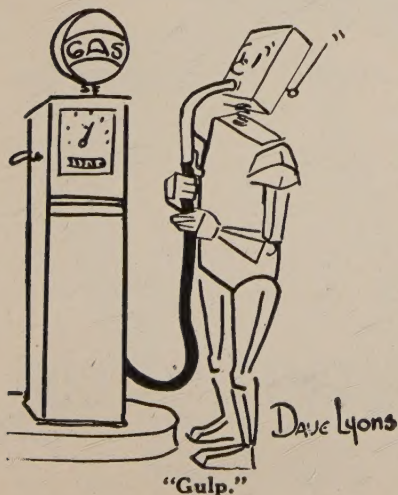
Shortage of housing facilities has resulted in overcrowding most centrally located hotels in metropolitan cities where the SOGES might meet in coming years. Even planning the 1947 meeting place and dates one year ahead resulted in running into complications and the necessity of moving convention dates a week ahead of those selected by the Cedar Rapids convention.



I find that the larger, more aggressive associations have already selected not only their 1947 convention sites and dates, but most of them are booked ahead for 1948, 1949 and 1950. This situation will probably not rectify itself within five years from what hotel authorities tell me. Consequently I believe it is none too early for our ever-growing association to protect itself as others are doing and to decide on cities and dates for several years ahead.

Some suggested cities include: Toronto, Winnipeg, Montreal, Duluth, Milwaukee, St. Louis, Indianapolis, French Lick, Buffalo, Toledo, Louisville, Memphis, New Orleans, Peoria, Enid, Fort Worth-Dallas, Wichita-Hutchinson, Denver, etc.

If the membership will convey to me their first five choices, along with preferences for dates in each location, then we will go to work and make the necessary arrangements. Will you drop me a line today? A post card will suffice. Thanks.—Harold Wilber, A. E. Staley Mfg. Co., Decatur, Ill., SOGES President.



## CHAPTER VISITS ST. JOE

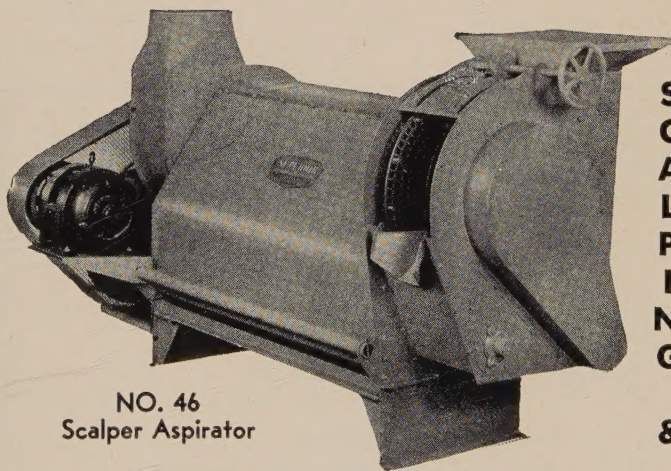
The November meeting of the Kansas City SOGES Chapter was held in St. Joseph, Mo., under the auspices of The Quaker Oats Co. An interesting program, arranged by member Jess Pugh with the co-operation of other Quaker officials, included a tour of the plant. Many points of particular interest to the visitors were explained by Plant Superintendent Angus McDonald.

Of inestimable value to everyone in attendance was a talk by Grain Department Manager A. B. Plummer in which he listed grain data for this area. This was the opening feature

of the business meeting held at 6:30 in the Pennant Cafeteria.

Mr. C. R. Martin, Manager of the plant, delivered the principal address of the evening. His pertinent remarks will long be remembered, and the thoughts he expressed will be much discussed for many meetings to come.

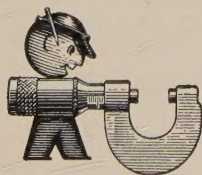
In addition to the foregoing, W. M. Clark, Assistant Plant Manager; T. R. Ingles, Assistant Elevator Superintendent; Ray Routh, Feed Mill Superintendent, and Ken Clark of the Ken Clark Grain Co., were other welcome guests in attendance.—George Spafford, Standard Milling Co., Kansas City SOGES Chapter Secretary.



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Scalper Aspirator

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600  
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PER  
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SCALPING  
&  
ASPIRATING

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When you must remove thrash, sticks, paper and other coarse matter from grains, the No. 46 Scalper Aspirator will operate at 200-600 bushels per hour. At the same time all the light screenings are micro-accurately removed without loss of good grain. Height to feed intake 56"; width OA, 52"; length OA, 80". For COMPACTNESS, ACCURACY, CAPACITY, get complete details of the No. 46.

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## WANTS INDIANAPOLIS UNIT

I would like to see an Indianapolis Chapter of the Superintendents' Society established, and would be glad to give any help I could in forming one. The SOGES is a fine organization. I know that it is quite an advantage for any firm to have one or more of their men meet others in the same work to discuss mutual mechanical and operative problems. I have enjoyed meeting with the Society's members on the few occasions I could and hope to continue meeting with the group—to say nothing of helping start an outstanding chapter here.—M. M. Darling, Acme-Evans Co., Inc., Indianapolis.

## INVITING FOREMEN

Commendable is the effort of the Minneapolis Superintendents' Chapter in making an annual event of the Foremen's Night, as they did for their November meeting, according to SOGES President Harold C. Wilber of Decatur, Ill. "It is most gratifying to observe the strides being made by the plant operators in the field of personnel relations, as well as in innumerable other categories," he comments. "This sort of thing ought to be done on a wider scale, not only in SOGES Chapters, from which leadership is naturally looked for, but on a smaller basis where conditions do not permit a collective effort."

## CHICAGO CALLERS

J. Primrose Brown of Glasgow, Scotland, and James Hunter of London, England, both Managing Directors of Hugh Baird & Sons, Ltd., maltsters, head the list of this month's visitors. While here they visited the Albert Schwill & Co. malt house, the Corn Products Refining Co., and the Utilities Research Commission, among other industries.

Also listed in Chicago's Guest Book were James Auld, Hales & Hunter Co., Minneapolis SOGES Chapter Secretary; Jim Keir, Manager, National Milling Co., Toledo; Harry J. Aldrich, Spencer Kellogg & Sons, Inc., Buffalo; Hal Seplutwiler, Albers Milling Co., Oakland, Calif.; John O. B. Elfelt, Big Jo Flour Mills, Wabash, Minn., and Dave Swan, Gruendler Crusher & Pulverizer Co., St. Louis.

Ralston - Purina representatives ringing Chicago's doorbell, include: C. R. Church, Woodstock, Ont.; James Hedrick, Buffalo; Ed. A. Dunning, Wilmington, Del.; N. R. Adkins, Lafayette, Ind.; Dave L. Grant, Production Manager of Eastern Division, St. Louis; H. L. Colwell, Manager, Elevator A, mill, etc., St. Louis, and George H. Steel, able Safety Director, St. Louis.

International Milling Co.'s callers were: F. O. Feller, Greenville, Tex.; M. T. Coulter, Humberstone, Ont.;

## "GRAIN"

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Editor and Business Manager—  
Dean M. Clark

New York Representative, K. C. Pratt, Inc., 50 East 42nd Street, New York 17, N. Y. Phone MURRAY Hill 2-3730.

Wilbert J. Aldrich, and Al Desimone, Buffalo, and Don Hansen, Safety Director, Minneapolis. Robin Hood Flour Mills representatives included: R. Kirkwood, Moose Jaw, Sask.; T. J. Millener, Calgary, and J. H. Hemmerling, Saskatoon. General Millers folks in town were: A. C. Hurbaugh, Oklahoma City, and J. H. Councilman and Safety Director Paul L. Backman, Minneapolis.

From the corn refining industry were: Lynn A. Gregg, No. Kansas City; Charles H. Lovton, Pekin; Ray J. O'Leary, Chicago; and C. M. Mack, Argo, all of Corn Products Refining Co. From The Hubinger Co., Keokuk, Ia., were John W. Rogers and W. W. Wolf. From A. E. Staley Mfg. Co., Decatur, Ill., were Roy Rollins and Mike Paezak. From Clinton (Ia.) Industries came Earl F. Gomoll, and from American Maize-Products Co., Poby, Ind., came John P. Groff.

## CLARK POWER GRAIN SHOVELS

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Single or Double Types

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## HIGH CAPACITY GRAIN CLEANING EQUIPMENT for TERMINAL ELEVATORS!



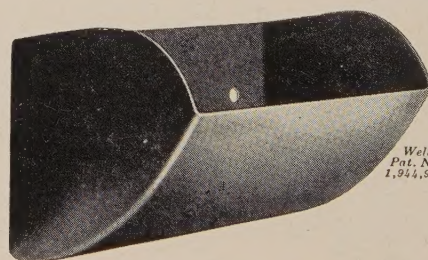
New Disc-Cylinder Catalog Just Published. Write for Your Copy.

Hart-Carter offers a complete line of special, heavy-duty cleaners for terminal elevators. Included are the 2564 Carter Disc-Cylinder Separator, combining discs and cylinders; and the all-cylinder 45 Hart Uni-flow Grain Separator. These machines offer a profitable answer to whatever cleaning, grading, separating or processing jobs you may be called on to handle.

**HART-CARTER COMPANY**

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Minneapolis, Minn.



## IF CALUMET CUPS GREW ON TREES

... we wouldn't have much trouble in promptly filling the stacks of orders that are being received for the elevator bucket with the Logarithmic Curve. But the process of manufacture requires time and steel (which isn't always easy to get these days). So, please, pretty please, place your orders well in advance of your requirements ... and we'll all be happy.

**CALUMET SUPER CAPACITY CUP**

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Chicago 4, Ill.

GRAIN





# Weevil-Cide SPLITTERS

## GROUNDS FOR DIVORCE

Mr: "I'm not arguing with you!"

Mrs: "No, but you were listening in a very unpleasant manner!"

\* \* \*

## HAD HAD EXPERIENCE

Clerk: "These are especially strong shirts, Madam. They simply laugh at the laundry."

Customer: "I know that kind. I had some which came back with their sides split."

\* \* \*

## COLOR BLIND

"There's only one thing wrong with me, Blondie, I'm color blind."

"You-all sho' mus' be, mistah."

\* \* \*

## A WARNING

Wife (to late retiring husband): "That you, dear?"

Husband: "It had better be me!"

\* \* \*

## MARRIAGE WISDOM

Advice to maidens: Don't marry a man to reform him. The rites never right him and the altar wont alter him.

\* \* \*

## PROGRESS

Husband: "My dear, I really don't believe you can ever teach that dog to obey you."

Wife: "Nonsense, darling. Remember how obstinate you were when we were first married."

## TOLERANCE

The Texas-born captain of an all-Texas company in North Africa told his men: "Our job here is to promote good neighborliness, among other things. We've got to humor the natives. If they say Africa is bigger than Texas, agree with them!"

\* \* \*

## WORN

A girl standing on the corner and wearing a low-cut V-neck sweater was approached by a "wolf" who asked her if that V was for Victory. Whereupon the girl replied, "No, that is for Virtue, but it's an old sweater."

\* \* \*

## EXPERT ADVICE

"Say! Who told you that you could neglect your office duties just because I kiss you every now and then?"

"My lawyer."

\* \* \*

## TEMPERATURE NORMAL

First patient: "The touch of the nurse's hand cooled my fever instantly!"

Second patient: "Yeah, we heard the slap all over the ward!"

\* \* \*

## EVIDENCE OF INFIDELITY

A small boy was overheard telling a playmate: "Papa and mama painted some real pretty Easter eggs for Sis, and hid them in the hen house so she wouldn't find them. Then old Cocky, the rooster, came along and saw 'em. Right away he flew over the fence and licked that old peacock in the next yard."

\* \* \*

## MILITARY PRECISION

Asked if two years in the army had made any difference in his son, a deep-South farmer reflected: "Well, he's still a good hand with the plow, but I note his language has changed some. It used to be, 'Whoa, Becky!'

Haw! Git up!' Now, when he comes to the end of a row, he says: 'Halt, Rebecca! Pivot and proceed!'"

\* \* \*

## UNWARRANTED INTERFERENCE

A beggar approached a man on the street. "Mister, I've had nothing to eat for three days. Will you please give me a dollar?"

"No!" said the man. "If you're that bad off I'd think you'd ask for a quarter instead of a whole dollar."

"Give me a dollar, or give me a quarter, whichever you please," said the beggar, "but please don't tell me how to run my business."

\* \* \*

## NO MARGIN FOR ERROR

Old Uncle Mose presented a check for \$9.37 at the local bank in a small Southern town. He took the money from the teller, counted it, then re-counted it. He didn't seem to be satisfied.

"What's the matter, Uncle Mose?" asked the teller, "isn't it right?"

"Yassuh," was the grudging reply, "but it just barely is."

\* \* \*

## EMANCIPATION

"Just think, children," said the missionary, "in Africa there are six million square miles where little boys and girls have no Sunday school. Now what should we all strive to save our money for?"

"To go to Africa!" cried a chorus of cheery voices.

\* \* \*

## FRIGID AIR

An electrician was examining an electric refrigerator that was using too much electricity and could not find the reason. He idly asked the cook, "How do you like the refrigerator?"

"Like it fine," she said. "I open the door and it cools off the whole kitchen."



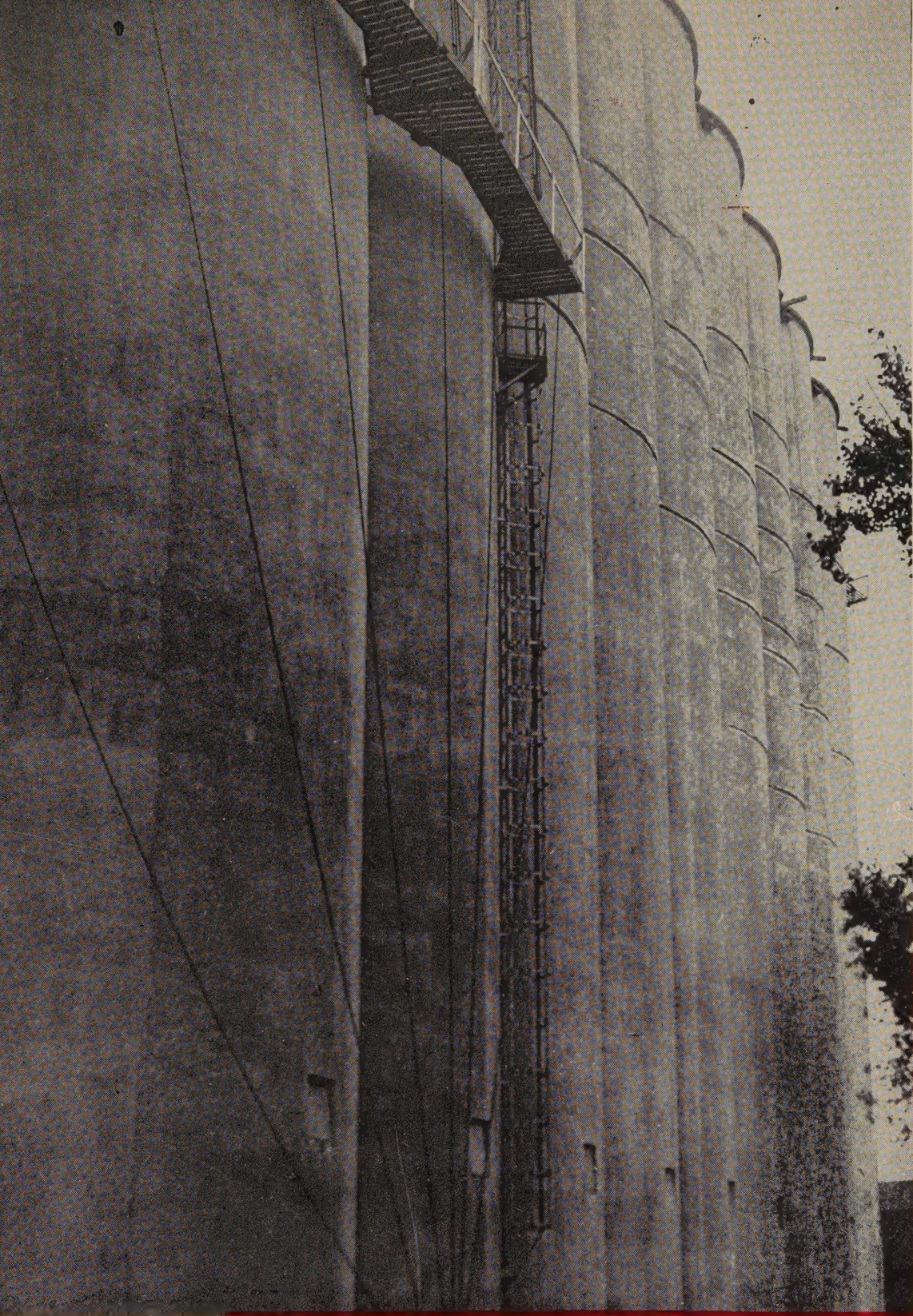
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